



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/738,332	12/17/2003	Carolus Matthias Anna Maria Mesters	TS1313 (US)	7939
Yukiko Iwata Shell Oil Company Legal - Intellectual Property P.O. Box 2463 Houston, TX 77252-2463				
7590 04/05/2010			EXAMINER BOYER, RANDY	
			ART UNIT 1797	PAPER NUMBER
			MAIL DATE 04/05/2010	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/738,332

Applicant(s)

MESTERS ET AL.

Examiner

RANDY BOYER

Art Unit

1797

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 January 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1, 2, 9, 11-21, 24-26, 30 and 33-64 is/are pending in the application.
- 4a) Of the above claim(s) 54-64 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 9, 11-21, 24-26, 30, 33-44, 46, 49 and 52 is/are rejected.
- 7) ☒ Claim(s) 45, 47, 48, 50, 51 and 53 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-940)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Amendment

1. Examiner acknowledges Applicant's response filed 19 January 2010 containing amendments to the claims and remarks.
2. Claims 1, 2, 9, 11-21, 24-26, 30, and 33-64 are pending. Claims 54-64 are newly added.
3. Newly added claims 54-64 are withdrawn as being directed to a non-elected invention (see discussion below). Consequently, only claims 1, 2, 9, 11-21, 24-26, 30, and 33-53 are pending for examination.
4. The previous rejections of claims 1, 2, 9, 11-21, 24-26, 30, and 33-44 under 35 U.S.C. 103(a) are withdrawn in view of Applicant's amendments to the claims. New grounds for rejection of claims 1, 2, 9, 11-21, 24-26, 30, and 33-44, necessitated by Applicant's amendments to the claims, are entered under 35 U.S.C. 103(a).
5. Newly added claims 46, 49, and 52 are rejected under 35 U.S.C. 112, first paragraph.
6. Newly added claims 45, 47, 48, 50, 51, and 53 are indicated allowable. The rejections follow.

Election/Restrictions

7. Newly added claims 54-64 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons: Originally filed

(and previously examined) claims 1, 2, 9, 11-21, 24-26, 30, and 33-44 are drawn to a process whereas newly added claims 54-64 are drawn to a composition.

Since Applicant has already received an action on the merits for the originally presented invention (process), this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 54-64 are withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

9. Claims 46, 49, and 52 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contain subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors, at the time the application was filed, had possession of the claimed invention.

10. With respect to claims 46, 49, and 52, the claims recite "wherein said catalyst carrier further comprises a non-refractory oxide bulk material" (emphasis added). The independent claims from which claims 46, 49, and 52 ultimately depend recite "a catalyst carrier comprising zirconia that is stabilized or partially stabilized with yttria." Thus, when read in the proper context, claims 46, 49, and 52 recite "a catalyst carrier

comprising zirconia that is stabilized or partially stabilized with yttria, the carrier further comprising a non-refractory oxide bulk material.” There is no disclosure in the specification as originally filed to support such limitation found in claims 46, 49, and 52. In contrast, the specification makes clear that a catalyst carrier comprising a non-refractory oxide bulk material is an alternative for a catalyst carrier comprising a refractory oxide, such as zirconia stabilized or partially stabilized with yttria (see Applicant’s specification, page 4, lines 21-34; and page 5, lines 1-4). Nowhere in the specification is it provided that the catalyst carrier may simultaneously comprise both a refractory oxide material and a non-refractory oxide bulk material together as part of the same carrier. Thus, claims 46, 49, and 52 recite “new matter” not found in the original specification.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
13. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
14. Claims 1, 2, 9, 11-21, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Frame (US 3,978,137) in view of Yoo (US 3,945,914) and Mahadev (WO 92/20621), as evidenced by Clavenna (US 5,476,877).
15. With respect to claims 1, 2, 9, 11-19, 21, and 24, Frame discloses a process comprising contacting a hydrocarbon feedstock containing mercaptan compounds with air and a catalyst comprising platinum, rhodium, or iridium on a zirconia support at a temperature between about 50C and about 400C at a pressure of about 1 atm (see Frame, column 1, lines 4-12; column 2, lines 42-45; column 3, lines 1-19; and column 4, lines 10-13 and 60-65).

Frame does not explicitly disclose wherein the feed is a gaseous feedstock containing at most 5 vol% hydrogen sulfide and where the feed mixed with the oxygen-containing gas has an oxygen-carbon ratio below 0.10. Frame also does not explicitly disclose wherein the platinum, rhodium, or iridium are present at a concentration in the

range from 0.02% to 10% based on the weight of the catalyst; or wherein the zirconia support is one that has been stabilized or partially stabilized with yttria.

However, Mahadev discloses a feed stream of natural gas containing up to 10 wt% hydrogen sulfide (see Mahadev, page 1, lines 21-24; and page 2, lines 3-9). Mahadev explains that the adsorptive capacity of the catalyst remains unchanged for feeds with less than 10 wt% of hydrogen sulfide (see Mahadev, page 32, lines 3-9). In addition, Yoo explains that a hydrocarbon feed mixture of oxygen-containing has an oxygen-sulfur ration of about 0.5 with the sulfur content of the feed being about 1 wt%. Because hydrocarbons comprise carbon atoms, 99% of the feed would contain carbon atoms. Thus, the oxygen-carbon ratio of the feed would be approximately 0.005 (see Yoo, column 1, lines 64-68; and column 2, lines 46-63). Yoo further explains that the concentration of oxidant is usually dependent on the amount of sulfur present in the hydrocarbon material (see Yoo, column 2, lines 46-53). Finally, Clavenna discloses an yttria-stabilized zirconia catalyst support material for use in oxidation reactions, the yttria-stabilized zirconia being highly attrition resistant under process conditions (see Clavenna, Abstract).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Frame to include a feed stream of natural gas containing up to 10 wt% hydrogen sulfide (as taught by Mahadev) in order to preserve the adsorptive capacity of the catalyst. Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the process of Frame to provide an oxygen-carbon ration of the feed of

approximately 0.005 since the amount of oxygen present in the feed is dependent upon the amount of sulfur present in the feed (as evidenced by Yoo).

With respect to the claimed concentration of metals present in the catalyst, Examiner notes that differences in concentration will generally not support the patentability of subject matter encompassed by the prior art unless there is evidence to establish that such concentration is critical. See MPEP § 2144.05(II)(A).

Finally, with respect to Applicant's amendment of the transitional phrase "comprises" to "consisting essentially of" to introduce the catalyst composition to be used in the claimed process, Examiner notes that "for the purposes of searching for and applying prior art under 35 U.S.C. 102 and 103, absent a clear indication of what the basic and novel characteristics [of the claimed invention] actually are, 'consisting essentially of' will be construed as equivalent to 'comprising.'" See MPEP § 2111.03.

16. With respect to claim 20, Mahadev discloses a flue gas having a concentration of sulfur dioxide in the range of 1000 ppm to 2000 ppm (see Mahadev, page 17, lines 7-9).

17. Claims 1, 2, 9, 11-21, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over De Jong (US 5,720,901), as evidenced by Clavenna (US 5,476,877).

18. With respect to claims 1, 2, 9, 11-21, and 24, De Jong discloses a process comprising: contacting a mixture of a hydrocarbonaceous feedstock (see De Jong, column 4, lines 20-24) containing any of various sulfur compounds (see De Jong, column 4, lines 65-67; and column 5, lines 1-16) in an amount ranging from 0.05 ppm to 100 ppm (see De Jong, column 5, lines 22-26) and an oxygen-containing gas (see De Jong, column 4, lines 30-31) with a catalyst (see De Jong, column 4, lines 65-67), wherein the catalyst may comprise platinum, rhodium, or iridium in the range of 0.01

wt% to 20 wt% (see De Jong, column 6, lines 6-10), supported on a catalyst carrier (e.g., zirconia) (see De Jong, column 6, lines 11-14).

De Jong does not explicitly disclose wherein the contact temperature is at most 500°C or wherein the feed mixture has an oxygen-to-carbon ratio of below 0.15. De Jong also does not explicitly disclose wherein his catalyst carrier is a zirconia that has been stabilized or partially stabilized with yttria.

However, De Jong discloses wherein the process may be operated at any suitable temperature (see De Jong, column 5, line 44; and claim 14) and any suitable pressure (see De Jong, column 5, lines 36-37; and claim 14), and wherein the feed may comprise the hydrocarbon feedstock and oxygen in any amount sufficient to give a suitable oxygen-to-carbon ratio (see De Jong, column 4, lines 50-52). Moreover, De Jong explains that: (1) the level of sulfur compounds in the feed is variable (see De Jong, column 5, lines 22-26); and (2) the desired level of conversion will necessarily depend upon the severity of the process conditions (temperature, pressure) used (see De Jong, column 5, lines 36-49). Finally De Jong discloses that his catalyst support material may be any of the type that is already known in the art. In this regard, Clavenna discloses an yttria-stabilized zirconia catalyst support material for use in oxidation reactions, the yttria-stabilized zirconia being highly attrition resistant under process conditions (see Clavenna, Abstract).

Therefore, Examiner finds Applicant's limitations regarding process temperature and oxygen-to-carbon ration to be of no patentable consequence because: (1) such conditions are not critical to the process of De Jong, i.e. the process of De Jong could conceivably be carried out at any temperature and with any oxygen-to-carbon ratio so

long as De Jong's overall objectives were satisfied; and (2) De Jong recognizes process temperature (along with pressure) as a result-effective variable, changes in which will necessarily result in changes to the overall level of conversion of the feedstock components. See MPEP § 2144.05(II)(A),(B).

19. Claims 25, 26, 30, and 33-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over De Jong (US 5,720,901) in view of D'Souza (US 4,233,276), as evidenced by Clavenna (US 5,476,877).

20. With respect to claims 25, 26, 30, and 33-44, see discussion *supra* at paragraph 18.

De Jong discloses wherein the effluent from the oxidation step may be further treated by passing such product stream through a bed of adsorbent suitable for removing the sulfur-containing components produced in the oxidation step (see De Jong, column 8, lines 11-27).

De Jong does not explicitly disclose wherein the adsorbent is copper oxide or barium oxide.

However, De Jong discloses wherein the adsorbent may be zinc oxide (see De Jong, column 8, line 27) which is an art-recognized substitute for copper oxide and barium oxide as an adsorbent material for the removal of sulfur-containing components in an oxidized stream (see D'Souza, column 6, lines 13-25). In this regard, Examiner notes that the mere substitution of prior art elements known to be useful for the same purpose supports a finding of *prima facie* obviousness. See MPEP § 2144.06.

Allowable Subject Matter

21. Claims 45, 47, 48, 50, 51, and 53 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

22. The following is Examiner's statement of reasons for allowance:

With respect to claims 45, 47, 48, 50, 51, and 53, the prior art of record does not disclose or suggest a process for the catalytic selective oxidation of a sulfur compound contained in a hydrocarbonaceous feedstock, such process using an oxidation catalyst consisting essentially of: (1) a catalytically active group VIII noble metal selected from the group consisting of platinum, rhodium, iridium, and combinations of two or more thereof at a concentration in the range from 0.02 to 10% by weight, based on the total weight of the catalyst; (2) zirconium; and (3) cerium.

Response to Arguments

23. Applicant's arguments filed 19 January 2010 have been fully considered but they are not persuasive.

24. Examiner understands Applicant's arguments to be:

- I. Applicant's specification provides much discussion that indicates the basic and novel characteristics of the catalyst of the claimed process.
- II. One distinction of the claimed process over the teachings of Examiner's cited references is that the yttria is used to stabilize or partially stabilize the zirconia of the catalyst carrier. There is no indication in the cited prior art of the use of yttria

for the purpose of stabilizing zirconia that is used as a catalyst support.

- III. The process of De Jong involves the oxidation of hydrocarbons which is completely different from the claimed process.
- IV. De Jong does not mention the use of an yttria-stabilized zirconia carrier with the particular combination of active metals of Applicant's catalyst.

25. With respect to Applicant's first, second, and fourth arguments, the use of zirconia that has been stabilized or partially stabilized with yttria as the catalyst support/carrier cannot be considered a novel characteristic of the claimed process, inasmuch as: (1) both Frame and De Jong disclose the use of zirconia catalyst support materials; and (2) yttria-stabilized zirconia was already known in the art as a suitable catalyst carrier/support for use in oxidation reactions, as evidenced by Clavenna.

26. With respect to Applicant's third argument, Examiner does not consider such argument persuasive because De Jong discloses the processing of the same or substantially similar feed using the same or substantially similar oxidation catalyst material at variable conditions of temperature and pressure. In such instance, the person having ordinary skill in the art would reasonably expect that processes carried on the same or substantially similar feed material using the same or substantially similar catalyst material and with variable process conditions of temperature and pressure that could be adjusted to within the claimed range to have the same effect – i.e. the process of De Jong would be expected to oxidize the sulfur compounds found in the feed material to De Jong's process. In this regard, De Jong notes that sulfur compounds remaining in the effluent stream after oxidation may be removed in a downstream

desulfurization unit by contact with a metal oxide adsorbent, similar to Applicant's claim 25 (see De Jong, column 7, lines 51-57; and column 8, lines 11-27).

Conclusion

27. The prior art made of record and not expressly relied upon is considered pertinent to Applicant's disclosure: Keller (US 6,946,111) and Lampert (US 7,074,375).

28. Applicant's amendment necessitated the new grounds of rejection presented in this Office Action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

29. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Randy Boyer whose telephone number is (571) 272-7113. The examiner can normally be reached Monday through Friday from 10:00 A.M. to 7:00 P.M. (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola, can be reached at (571) 272-1444. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Randy Boyer/

Examiner, Art Unit 1797

/Glenn A Caldarola/

Supervisory Patent Examiner, Art Unit 1797